REMARKS

I. Introduction

In response to the Office Action dated October 19, 2005, no claims have been cancelled, amended or added. Claims 1-30 remain in the application. Re-examination and re-consideration of the application is requested.

II. Information Disclosure Statement

Applicants' attorney submitted an Information Disclosure Statement (IDS) on October 16, 2001. However, Applicants' attorney never received an initialed Form PTO-1449.

Applicants' attorney re-submitted the IDS with the response to the previous Office Action mailed on April 5, 2005. However, Applicants' attorney did not receive an initialed Form PTO-1449 with the final Office Action dated June 22, 2005.

Record is made of a telephonic interview that occurred on August 22, 2005 between Examiner Coffy and Applicants' attorney. Applicants' attorney informed Examiner Coffy that he had not received an initialed Form PTO-1449 for the IDS, and noted that the IDS had been re-submitted with the response to the previous Office Action mailed on April 5, 2005. Examiner Coffy requested that Applicants' attorney again note these facts in the response to the final Office Action, and that an initialed Form PTO-1449 would be provided.

Applicants' attorney requests that the Examiner initial the Form PTO-1449 and return it to Applicants' attorney.

III. Prior Art Rejections

A. The Office Action Rejections

In paragraphs (3)-(4) of the Office Action, claims 1-2, 4-9, 11-12, 14-19, 21-22, and 24-29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sen et al., U.S. Patent No. 6,691,312 (Sen) in view of Aharoni et al., U.S. Patent No. 6,014,694 (Aharoni) and further in view of Duruöz et al., U.S. Patent No. 6,658,056 (Duruöz). In paragraph (5) of the Office Action, claims 3, 13, and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sen in view of Hazra, U.S. Patent No. 6,510,553 (Hazra). In paragraph (6) of the Office Action, claims 10, 20, and 30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sen in view of Tremblay et al., U.S. Patent No. 6,343,348 (Tremblay).

Applicants' attorney respectfully traverses the rejections.

B. The Sen Reference

Sen describes a method of multicasting video to multiple client nodes via intermediate nodes that includes accessing video information descriptive of the video to be multicast, accessing information describing a distribution tree of nodes from a source of the video to the multiple clients nodes via one or more internetwork nodes, accessing rate constraints of nodes in the distribution tree, accessing buffer allocations of the nodes in the distribution tree, and determining one or more smoothed transmission schedules for each node in the distribution tree based on the accessed video information, the accessed information describing the distribution tree, the accessed rate constraints of nodes in the distribution tree, and the accessed buffer allocations of the nodes in the distribution tree, the one or more transmission schedules describing the transmission of video data to one or more children nodes.

C. The Aharoni Reference

Aharoni describes a system for adaptively transporting video over networks wherein the available bandwidth varies with time. The system comprises a video/audio code that functions to compress, code, decode and decompress video streams that are transmitted over networks having available bandwidths that vary with time and location. Depending on the channel bandwidth, the system adjusts the compression ratio to accommodate a plurality of bandwidths ranging from 20 Kbps for POTS to several Mbps for switched LAN and ATM environments. Bandwidth adjustability is provided by offering a trade off between video resolution, frame rate and individual frame quality. The system generates a video data stream comprised of Key, P and B frames from a raw source of video. Each frame type is further comprised of multiple levels of data representing varying degrees of quality. In addition, several video server platforms can be utilized in tandem to transmit video/audio information with each video server platform transmitting information for a single compression/resolution level.

D. The Duruöz Reference

Duruöz describes a digital video presentation system provided with a decoder to decode full frame MPEG-2 video by a single method that applies regardless of buffer memory and frame rate conversion considerations. A display control module handles frame rate and field sequence in response to host configuration, particularly buffer memory size and display type (NTSC or PAL), to

host trick play command signals, and to information in the received bitstream. Pictures are decoded as buffer memory for the decoded pictures becomes available, and picture display attributes are assigned and stored in a table, one string for each decoded picture. Field display logic is informed of the to memory address of the next field to be displayed along with the attributes needed for affecting proper field display sequence, and flagging whether the memory is to be freed for use by the decoder as the field is being displayed and whether the decoder is to decode the next picture as the field is being displayed. Where memory is small, opposite field data can be output. Field sequence order is provided for output buffers in the range of from 0.53 to 0.67 frames in size, or a full frame in size. Buffer memory is optimized by maintaining tables of offset variables and accessing a fixed table of memory pointers as fields of data are being displayed. The offset data tables are identified to the display logic, which uses the data in the specified offset table to address rows of memory in which the consecutive rows of particular field to be displayed are stored. The decoder loads offset values into the offset tables as pictures are being decoded and rows of blocks of the picture are stored as memory becomes free.

E. The Hazra Reference

Hazra describes reception of digital multimedia data signals from multiple sources in a stream over a fixed bandwidth communications path may be accomplished by subscribing to a base layer of a first source and a base layer of a second source, and subscribing to an enhancement layer of the first source. Data signals corresponding to the subscribed layers of the first and second sources may be received in a stream over the fixed bandwidth communications path, output signals may be produced which correspond to the received data signals for the first source, and output signals may be produced corresponding to the received data signals for the second source. The output signals for the first source may be displayed in a first portion or window of a display, and output signals for the second source may be simultaneously displayed in a second portion or window of the display, thereby providing a picture-in-picture (PIP) display for streaming digital video.

F. The Tremblay Reference

Tremblay describes a multi-ported register file is typically metal limited to the area consumed by the circuit proportional with the square of the number of ports. A processor having a register file structure divided into a plurality of separate and independent register files forms a layout structure

with an improved layout efficiency. The read ports of the total register file structure are allocated among the separate and individual register files. Each of the separate and individual register files has write ports that correspond to the total number of write ports in the total register file structure. Writes are fully broadcast so that all of the separate and individual register files are coherent.

G. The Applicants' Invention is Patentable Over the References

The Applicants' invention, as recited in independent claims 1, 8, 11, 18, 21 and 28, is patentable over the references because the claims recite limitations not shown by the references.

According to the Office Action, Sen, Aharoni and Duruöz, when combined, teach all the elements of the independent claims 1, 8, 11, 18, 21 and 28.

In this regard, the Office Action asserts that the limitations "displaying selected frames from said frame source, on said display means, at their due time in order to maintain timing integrity of the clip," and "skipping frames in said frame sequence in response to an indication of the data transfer rate of said network" of claims 1, 11 and 21, and the limitations "selecting a next frame for preloading by skipping at least one frame in the clip's frame sequence," "preloading a frame from said frame source into a frame queue in said memory means," "displaying a preloaded frame at its due time in order to maintain timing integrity of the clip," "processing elapsed real time since the clip started playing with a frame timing parameter," and "updating the number of frames to skip in response to said processing of elapsed real time," of claims 8, 18 and 28, can be found in the Duruöz reference. Specifically, the Office Action asserts that these limitations are described in Duruöz at col. 6, lines 5-35, col. 9, lines 54-59, col. 11, lines 40-65, and col. 16, lines 13-45.

These portions of Duruöz are set forth below:

> Duruöz: Col. 6, lines 5-35 (actually, col. 5, line 66 – page 6, line 35)
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> A particular objective of the present invention is to provide an efficient and effective system and method for performing frame rate conversions such as, for example, 3-2 pull down conversions including pull down in VCD and DVD and NTSC-PAL or PAL-NTSC conversions. More particular objectives of the invention include providing for such 3-2 pull down while facilitating the use of commands such as pause, fast-forward, slow forward, reverse play and other such commands which are often referred to as "trick play" commands. Such objectives also include implementing frame skipping required in audio-visual synchronization.
>
> Another objective of the present invention is to provide in an MPEG video decoder one module and routine to handle frame rate conversions and other frame rate related issues, as well as frame rate related issues that are dependent on the amount of available buffer memory of the system in which the decoder is used. A further objective of the present invention is to provide an MPEG video decoder that

performs a single decompression and transformation method regardless of the occurrence of frame rate conversion and the conversion rate and regardless of differences in the display sequences due to the frame rate conversion, if any, employed, or due to buffer memory size.

A further objective of the present invention is to efficient and effective use of buffer memory and to facilitate the use of minimally sized buffer memory to buffer decoded video picture sequences for display during regular play, where frame rate conversions are required for program viewing, and during trick play modes and transitions into and out of trick play modes, particularly while maintaining optimal display quality. An additional objective of the invention is to provide a memory management system operative to map decoded pictures to buffer memory and allocate buffer memory so as to allow for the sharing of memory locations by more than one field in a way that reduces memory requirements.

Duruöz: Col. 9, lines 54-59 (actually, lines 45-59)

The FIFO buffers 63 are part of the random access DRAM 48, but are caused to function as first-in/first-out ring memory by the programming of the DMUX 53 and the memory controller 50. These FIFO buffers 63 have read and write pointers which automatically determine the addresses to and from which the next write and read commands write and read. The positions of these read and write pointers can be read by the RISC 61 and can be set by the RISC 61. As a result, the RISC 61 can move a read pointer of, for example, video FIFO 67 to repeat or skip a picture, and can suppress the advance of the write pointer to prevent or cause a picture from being overwritten to facilitate the repeating skipping, or reordering of pictures where desired. This accommodates frame rate conversions and certain trick play modes.

Duruöz: Col. 11, lines 40-65 (actually, lines 29-67)

According to the preferred embodiment of the invention, the RISC 61 includes field sequence control logic 80 to control the order of field data to the buffer 78, including the performance of frame rate conversions. Conversions that are made include, for example, 3-2 pull down conversions from 20 or 24 frame per second VCD or DVD to 25 frame per second PAL or 30 frame per second NTSC, as well as NTSC-to-PAL and PAL-to-NTSC conversions. The conversions are implemented while facilitating the use of commands such as pause, or may be suspended during other commands such as fast-forward, slow forward, reverse play and other trick play modes. In addition, the field sequence control logic 80 includes field repeat routine logic for determining the repeating of fields to be done when frame rate conversions so require, and for implementing frame skipping in audio-visual synchronization and in other situations where frame skipping is required.

This field sequence control logic 80 is contained in a single module within the RISC 61 which, along with a field sequence attribute setting subroutine 96, includes the entire routine needed to handle frame rate conversions and other frame rate related issues. In addition, the control logic 80 controls other frame rate related issues that are dependent on the amount of buffer memory provided by the many various forms of systems 30 in which the ASIC 40 is used. The control logic 80 controls these issues by determining the appropriate field display sequence, synchronizing the operation of the decoder 56, instructing the DMUX 53 if

necessary, and mapping and timing the storing of decoded video slice data to the output buffer 78 to carry out the field display sequence that the control logic 80 determines is appropriate. The control logic 80 allows a single decompression and transformation method regardless of the occurrence of frame rate conversion and regardless of the determined field display sequence or the inclusion therein of field repetition or field skipping. It accommodates output field buffers 78 that are one frame in size and buffers that are smaller, such as output buffers 78 that are only one or a few block-rows larger than one half frame (one field).

Duruöz: Col. 16, lines 13-45

The sequence control logic 80 determines the need for frame rate conversion and controls these functions so as to regulate the adding or skipping of fields or frames to bring about any frame rate conversion that is required to match the input video frame rate to that of the display 34. The sequence control logic 80 regulates the display sequence of the fields in response to information in the picture data bitstream and in accordance with configuration information and commands from the host. The information from the host to which the control logic 80 includes configuration data relating to the size of the output buffer 78, information regarding the format of the receiver (e.g., NTSC, PAL, etc.) and commands such as trick play mode commands (e.g., pause, fast-forward, reverse, etc.).

The sequence control 80 determines the order in which fields are to be decoded and when and to where in the buffer memory 78 decoded slices are to be written. It controls when the video decoder 56 decodes these slices and tells the decoder 56 to which rows of blocks of the output buffer 78 the decoded slices are to be written. The control logic 80 stores information regarding the locations in the buffer memory 78 of the various rows of data from the various fields of the input pictures in tables 82 in the buffer memory 42. From information in the video bitstreams, or where the bitstream does not contain the information by making certain default assumptions, it determines the display sequence of the fields of the received pictures. Where the frame display rate required of the display 34 differs from that at which the original received program was recorded, the control logic 80 specifies which fields are either repeated or skipped to make the display of the picture sequence acceptable, and where possible, MPEG compliant.

Applicants' attorney respectfully submits that the above portions of Duruöz do not teach or suggest the identified limitations of independent claims 1, 8, 11, 18, 21 and 28, as amended. Thus, even when combined, Sen, Aharoni and Duruöz do not teach or suggest all the elements of Applicants' claimed invention.

The above portions of Duruöz merely describe performing frame rate conversions such as, for example, 3-2 pull down conversions between different video formats, including pull down in VCD and DVD and NTSC-PAL or PAL-NTSC conversions (e.g., conversions from 20 or 24 frame per second VCD or DVD to 25 frame per second PAL or 30 frame per second NTSC, as well as NTSC-to-PAL and PAL-to-NTSC conversions). In Duruöz, the

frame rate conversion requires the adding or skipping of fields or frames. The frame skipping performed by Duruoz relates only to such conversions, as well as "trick play" commands, such as pause, fast-forward, slow forward, reverse play, etc.

However, Duruöz does not recognize the need for skipping frames in the same context as recited in Applicants' claims, i.e., on the basis of network bandwidth availability. Nor do any of the other references. Instead, Sen merely describes a method of multicasting video to multiple client nodes via intermediate nodes that includes smoothed transmission schedules, while Aharoni merely describes adaptively transporting video over networks where the available bandwidth varies with time, Hazra merely describes providing a picture-in-picture (PIP) display for streaming digital video, and Tremblay merely describes a multi-ported register file.

In the Applicants' invention, frames are transferred over a network from a remotely connected frame source and displayed at their correct time based on a frame rate in order to maintain timing integrity of a clip by skipping frames sequence in response to an indication of the data transfer rate of the network. In the Applicants' invention, frames are always displayed at their correct time, based on their frame rate, and this is achieved by skipping frames when necessary, regardless of a loss of network bandwidth availability. In the Applicants' invention, the only result will be a degradation in smoothness of the clip, because frames are skipped, but there is no modification of the rate at which the recorded events unfold. Thus, in Applicants' invention, a clip having a duration of one minute will always complete its playback in one minute, regardless of the available bandwidth of the network. Consequently, the display of frames from the clip takes place with the frames' relative timing preserved.

Specifically, Duruöz does not teach or suggest the amended limitations of claims 1, 11 and 21 directed to displaying selected frames from said frame source, on said display means, at their correct time based on the frame rate in order to maintain timing integrity of the clip by skipping frames in said frame sequence in response to an indication of the data transfer rate of said network. In addition, Duruöz does not teach or suggest the amended limitations of claims 8, 18 and 28 directed to selecting a next frame for preloading by skipping at least one frame in the clip's frame sequence, preloading a frame from said frame source into a frame queue in said memory means, displaying a preloaded frame at its correct time based on the frame rate in order to maintain timing integrity of the clip, processing elapsed real time since the clip started playing with a frame timing parameter, and updating the number of frames to skip in response to said processing of elapsed real time.

As a result, when combined, Sen, Aharoni, Duruöz, Hazra and Tremblay do not teach or suggest all the elements of Applicants' claimed invention. Moreover, the various elements of Applicants' claimed invention together provide operational advantages over Sen, Aharoni, Duruöz, Hazra and Tremblay. In addition, Applicants' invention solves problems not recognized by Sen, Aharoni, Duruöz, Hazra and Tremblay.

Thus, Applicants' attorney submit that independent claims 1, 8, 11, 18, 21 and 28 are allowable over Sen, Aharoni, Duruöz, Hazra and Tremblay. Further, dependent claims 2-7, 9-10, 12-17, 19-20, 22-27, 29 and 30 are submitted to be allowable over Sen, Aharoni, Duruöz, Hazra and Tremblay in the same manner, because they are dependent on independent claims 1, 8, 11, 18, 21 and 28, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-7, 9-10, 12-17, 19-20, 22-27, 29 and 30 recite additional novel elements not shown by Sen, Aharoni, Duruöz, Hazra and Tremblay.

IV. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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